

CLAIMS

1. A method of applying and accurately locating a plurality of caps to a plurality of microfabricated devices at the wafer stage, the method including:

- 5 a) forming, in a two part mold, a plurality of first hollow molded caps, from a layer of thermoplastic material which is placed in a mold, the mold having first and second mold halves which are brought together to form the caps, each cap having a central portion and a perimeter wall;
- 10 b) opening the mold so that the caps are carried as an array by the first half; then
- c) applying, using the first half, the array to one side of a wafer.
2. The method of claim 1 wherein, the mold and the wafer are made from the same material.
- 15 3. The method of claim 1 wherein, the mold is made from a semiconductor.
4. The method of claim 1 further comprising the step of separating the wafer into individual packages by a deep plasma etching process of the wafer for which process the first caps are a mask.
- 20 5. The method of claim 1 wherein, applying the caps further comprises using a cooperating release wafer having eject pins to urge the caps into position.
- 25 6. The method of claim 5 wherein, the first mold half has eject openings for receiving the pins, the pins being longer than the openings.
7. The method of claim 5 wherein, there is a gap between the first mold half and the release wafer and using the release wafer further comprises applying a vacuum to the gap to draw the release wafer toward the first mold half.
- 30 8. The method of claim 1 wherein, the cap is formed from a layer of thermoplastic material that is etchable under an oxygen plasma etch.

9. The method of claim 8 wherein, forming the cap comprises heating the thermoplastic material in the mold with infrared radiation, the mold being essentially transparent to the infrared radiation.

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10. The method of claim 1 wherein, the first and second mold halves each have holes for receiving eject pins which are formed on adjacent release wafers, the pins being longer than the holes.

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11. The method of claim 1 wherein, the thermoplastic material is 200-500 microns thick prior to being formed into caps.

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12. The method of claim 1 wherein, when the mold is closed, there is a thin layer of the material from which the caps are formed joining the caps into an array and the thin layer is removed by a squeezing action of the mold itself.

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13. The method of claim 1 wherein, when the mold is opened, there is a thin layer of the material from which the caps are formed joining the caps into an array and the thin layer is removed by an etch.

14. The method of claim 12 wherein, the thin layer is removed by the contact between unetched surfaces in the mold.

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15. The method of claim 5, wherein, the eject pins are flush with an interior mold surface during the forming.

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16. The method of claim 1, wherein, the first mold half has a lower surface into which is formed a series of recesses defined by lateral edges, the second mold half having an upper surface in which is formed a series of grooves, the grooves aligning with the edges, the recesses and grooves having a repeat spacing that corresponds to a spacing on a wafer to which the caps will be applied.

17. The method of claim 1, wherein the molds are pressed together in a conventional wafer bonding machine.

18. The method of claim 1, wherein:

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the first half includes first holes formed through it;
there being provided a first half release wafer from which project pins;
the pins located in registry with the first holes;
the first half having a thickness in the area of the first holes, the pins being longer
than the thickness;

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the first half release wafer having a first position in which the pins are flush with
interior ends of the first holes;
there being a gap between the first half and the first half release wafer when the first
half release wafer is in the first position; and wherein
a vacuum is applied to the gap to eject the caps.

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19. The method of claim 18, wherein:

the second half includes second holes formed through it;
there being provided a second half release wafer from which project pins;
the pins located in registry with the second holes;

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the second half having a thickness in the area of the second holes, the pins being
longer than the thickness;

the second half release wafer having a first position in which the pins are flush with
an interior end of the second holes;

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there being a second gap between the second half and the second half release wafer
when the second half release wafer is in the first position.